CCGS W.E. Ricker Gulf of Alaska Salmon Survey, March - April 1997

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by

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103-01921/

LIST OF TABLES

Page

Table 1. Tow positions and summary of Pacific salmon catches for the W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997. 8

Table 2. Biological data collected for each Pacific salmon caught on the CCGS W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997. 10

Table 3. Physical oceanographic data collected on the CCGS W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997. 11

Table 4. Zooplankton data from bongo tows collected on the W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997. 13

Table 5. Replicate sampling conducted to compare zooplankton abundance estimates with Bongo, SCOR and NORPAC nets, on the W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997. 14

LIST OF FIGURES

Page

Figure 1. Fishing stations completed on the CCGS W.E. Ricker survey to the Gulf of Alaska during March 11 - April 3, 1997. 15

Figure 2. Oceanographic stations completed on the CCGS W.E. Ricker survey to the Gulf of Alaska during March 11 - April 3, 1997. 16

Figure 3. Zooplankton stations completed on the CCGS W.E. Ricker survey to the Gulf of Alaska during March 11 - April 3, 1997. 17

Figure 4. Summary of chinook salmon catches on the CCGS W.E. Ricker survey to the Gulf of Alaska during March 11 - April 3, 1997. 18

Figure 5. Summary of sockeye salmon catches on the CCGS W.E. Ricker survey to the Gulf of Alaska during March 11 - April 3, 1997. 19

ABSTRACT

Welch, D. W., J. F. T. Morris, and E. Demers. 2002. *CCGS W.E. Ricker* Gulf of Alaska salmon survey, March - April 1997. Can. Data Rep. Fish. Aquat. Sci. 1101: 19 p.

A survey of the distribution of juvenile Pacific salmon (*Oncorhynchus spp.*) nearing the end of their first winter of life in the northern Gulf of Alaska was conducted from March 11 to April 3, 1997. Over a broad area of the northern Gulf of Alaska, almost no salmon were found. It is unclear how much of the absence of salmon from this large area of the Gulf of Alaska in 1997 was a result of the markedly reduced levels of abundance of all species of salmon that subsequently returned to Alaska later in the summer. If there was a westward displacement of salmon in the spring out of the study region, it was not due to elevated surface ocean temperatures that were within 1°C of average in March and April.

The Canadian Highseas program has conducted previous surveys in the falls of 1995 and 1996 that demonstrated that juvenile salmon were exclusively confined to the continental shelf between British Columbia to Kodiak Island, Alaska. However, juvenile salmon must migrate to the central Gulf of Alaska over the winter since they were absent from the continental shelf by the following spring. The absence of juvenile salmon at the end of winter in much of the offshore region that was surveyed suggests that most juvenile salmon swim far westward of Kodiak Island, Alaska, before eventually turning south and migrating offshore. The exact timing and westward extent of the juvenile migration on the shelf needs to be clarified in order to better understand the ocean biology of Pacific salmon, and establish the times and regions where changes in ocean climate can affect them.

RESUME

Welch, D. W., J. F. T. Morris, and E. Demers. 2002. *CCGS W.E. Ricker* Gulf of Alaska salmon survey, March - April 1997. Can. Data Rep. Fish. Aquat. Sci. 1101: 19 p.

Une étude sur la distribution des saumons du Pacifique juvéniles (Oncorhynchus spp.) à la fin de leur premier hiver en mer dans le Golfe de l'Alaska a été réalisée entre le 11 mars et le 3 avril 1997. Nous n'avons trouvé aucun saumon sur une vaste superficie du Golfe de l'Alaska. Il est difficile de déterminer à quel point l'absence de saumons dans cette région du Golfe de l'Alaska en 1997 était le résultat d'une réduction marquée de l'abondance de toutes les espèces de saumons qui retournaient en Alaska plus tard durant l'été. Les évidences disponibles d'indiquent pas un déplacement des saumons vers l'ouest et à l'extérieur de notre zone d'étude durant le printemps car la température était à 1°C de la moyenne en mars et avril.

Le programme canadien des Saumons en Haute mer a réalisé des études antérieures à l'automne de 1995 à 1997 qui ont démontré que les saumons juvéniles étaient confinés exclusivement sur le plateau continental entre la Colombie-Britannique et l'Ile Kodiak en Alaska. Cependant, les saumons juvéniles doivent migrer vers le centre du Golfe de l'Alaska durant l'hiver, car ils sont absents du plateau continental le printemps qui suit. Nous suggérons que la plupart des saumons juvéniles nagent en direction ouest jusqu'à l'Ile Kodiak, Alaska, avant de tourner vers le sud et migrer au large. La synchronisation exacte et l'étendue ouest de la migration juvénile sur le plateau continental a besoin d'être clarifiée afin de mieux comprendre la biologie des saumons du Pacifique dans l'océan, et d'établir quand et où les changements de climat océanique les affectent.

INTRODUCTION

A survey of the distribution of juvenile Pacific salmon (*Oncorhynchus spp.*) completing their first year of life in the Gulf of Alaska was conducted from March 11 to April 3, 1997, using a pelagic rope trawl on the *CCGS W.E. Ricker*. The spring survey had the following objectives:

1) to establish the distribution and abundance of juvenile pink (*O. gorbuscha*), chum (*O. keta*), sockeye (*O. nerka*), coho (*O. kisutch*), and chinook salmon (*O. tshawytscha*) in the central Gulf of Alaska near the end of their first year of life in the ocean and establish their offshore migration path;

2) to collect detailed oceanographic measurements on the Alaska Coastal Current in March on transects across the shelf off the Queen Charlotte Islands and Kodiak Island; and,

3) to collect detailed oceanographic measurements across the Gulf of Alaska to define the structure of the Alaskan Gyre in the spring.

MATERIALS AND METHODS

General Survey Information

Figures 1, 2 and 3 show the fishing, oceanographic and zooplankton stations, respectively, completed by the CCGS W.E. Ricker during the March 1997 survey. The track consisted of an outbound north west leg from the Queen Charlotte Islands to Cape Chiniak, Alaska, followed by a southern leg from the Trinity Islands off Kodiak Island to 49°30'N, 140°00'W in the eastern North Pacific, and then an eastward leg to Cape Scott, Vancouver Island. Included on this survey track were three detailed oceanographic and fishing transects on the continental shelf off the Queen Charlotte Islands and Kodiak Island where the stations were spaced at approximately 2.5 km intervals. A total of 49 fishing stations, 88 oceanographic stations and 43 zooplankton stations were completed during the survey. A description of the stations and transects completed during each survey is included below:

1) one continental shelf transect west coast of the Queen Charlotte Islands with 4 fishing and zooplankton stations, and 8 oceanographic stations;
2) one offshore transect from the Queen Charlotte Islands to Kodiak Island with 13 fishing and zooplankton stations, and 20 oceanographic stations;
3) one transect at Cape Chiniak at the eastern end of Kodiak Island with 8 fishing stations, 9 oceanographic stations and 7 zooplankton stations;
4) one transect at Sitkinak Island near the western end of Kodiak Island with 7 fishing stations, 11 oceanographic stations and 9 zooplankton stations;
5) one southward transect offshore of Sitkinak Island to 50°40'N 150°15'W with 13 fishing stations, 18 oceanographic stations and 10 zooplankton stations; and,

6) one long west to east transect offshore from 49°20'N 147°00'W to the northern tip of Vancouver Island with 4 fishing stations and 21 oceanographic stations.

One additional oceanographic station was completed south of the Queen Charlotte Islands at the beginning of the survey.

Ship, Fishing Gear and Fishing Operations

The CCGS W.E. Ricker is a 1,104 gross tonnes stern trawler, 58 m in length, 9.5 m in beam, and powered by a 2,500 H.P. model AH 40 Akasaka diesel engine. Fish sampling was conducted during daytime with a model 400/580 mid-water trawl, manufactured by Cantrawl Pacific Ltd., Richmond, BC. The trawl measured 200 m in length, and had a front-end section of hexagonal mesh made with 3/8 in (9.5 mm) and 5/16 in (7.9 mm) Tenex rope, a body made up of 64 in (163 cm), 32 in (81.3 cm), 16 in (40.6 cm), 8 in (20.3 cm) and 4 in (10.2 cm) polypropylene sections, an intermediate section of 3 in (7.6 cm) polypropylene, and a 1.5 in (3.8 cm) nylon cod end lined with 0.25 in (6.4 mm) mesh.

The trawl was typically deployed within 4-19 m of the surface at 5 knots (2.6 m s^{-1}) under good sea conditions. A measured trawl mouth opening of approximately 28 m horizontal by 16 m vertical (measured using a ScanMar trawl eye) was achieved using the following configuration: 100 m of 1.25 in (3.2 cm) steel warp, three 120 m 5/8 in (1.6 cm) bridles per side attached at a single hook-up to 5 m US Jet mid-water trawl doors. Eight 12 in (30.5 cm) diameter Scotsman floats were tied into a 5 m canvas kite attached to the headrope, and two 20 in (50.8 cm) diameter Scotsman floats were attached at each wing tip to provide added floatation. Approximately 750 lbs (340 kg) of chain was also attached on each side of the net.

Owing to a lack of salmon in the surface tows, the CCGS W.E. Ricker towed the trawl to a maximum of depth of 100 m. In cases where more than one depth for the headrope is reported in Table 1, the trawl was fished for periods of equal duration at several depths to ensure that the lack of salmon evident in near-surface waters was not due to their distribution at greater depths.

Oceanographic sampling

At all oceanographic stations, the scientific crew (1) conducted CTD (conductivity-temperature-depth) casts, (2) collected surface seawater samples for nitrate, phosphate, silicate and salinity from the ship's pumped sea water loop, (3) collected filtered surface seawater to measure chlorophyll *a* and phaeophytin, and (4) used an acoustic Doppler current profiler (ADCP) to measure velocities and direction of currents with depth.

CTD casts were conducted to within 5 m of the bottom or a maximum depth of 600 m using both a Guildline CTD probe (serial # 53977) and a Seabird SBE19 CTD probe (serial # 1031) CTD mounted together. At stations where sea conditions

prevented normal CTD operations, expendable bathythermograph (XBT) casts were conducted with T-5 probes.

Shelf stations off the Queen Charlotte Islands and Kodiak Islands were spaced at approximately 2.5 km intervals to obtain detailed cross-shelf profiles of temperature, salinity, and nutrients at depth. At these stations, water samples were drawn from Nisken bottles clamped at 25 m depth intervals on the co-axial CTD cable. Nitrate and phosphate samples were collected in acid-washed glass test tubes and stored frozen. Silicate samples were collected in acid-washed plastic test tubes and similarly stored. Barium and $\delta^{18}O$ samples were collected in high density plastic scintillation vials and stored at room temperature. Barium and $\delta^{18}O$ samples were collected as tracers in an attempt to define sources of fresh water contributions to the Alaskan Coastal Current.

A thermosalinograph recorded a continuous log of sea surface salinity and temperature from the ship's seawater loop. Surface seawater samples from the ship's seawater loop were taken at every station as a check on the accuracy of the CTD probes. Thermosalinograph, CTD and XBT data can be obtained from Joe Linguanti, Senior Analyst, Ocean Sciences & Productivity Division, Department of Fisheries and Oceans, Institute of Ocean Sciences, 9860 West Saanich Rd, Sidney, BC, Canada V8L 4B2. Tel: (250) 363-6586; E-mail: linguantij@dfo-mpo.gc.ca.

Surface samples were drawn from the ship's seawater loop at all stations for subsequent measurement of nitrate, phosphate, silicate, barium, $\delta^{18}O$ and salinity levels. A 300 ml seawater sample was filtered on an ashed GF/F Whatman glass fiber filter, folded in half, wrapped in aluminum foil and frozen for subsequent measurement of chlorophyll *a* and phytoplankton stable isotope ratios.

An acoustic Doppler current profiler (ADCP), RD Industries, frequency 150 kHz, was run continuously to measure velocities and direction of currents with depth along the survey track. The ADCP data was logged with Transect ver.1.82 software. ADCP analyses can be obtained from Dr. Andreas Münchow, Rutgers University, New Brunswick, New Jersey. E-mail: andreas@imcs.rutgers.edu

Zooplankton Sampling

Oblique bongo tows to approximately 150 m were conducted with two 57 cm diameter, 253 μm Nitex nets. One of the two nets was equipped with a flow meter. Standard sampling protocol was followed and consisted of a 0.3 m s^{-1} net retrieval speed while towing at 2 knots (1.0 m s^{-1}) after reaching the target depth. Most bongo tows were completed within 20 minutes from the time of deployment.

Zooplankton collected from the net with the flowmeter were preserved in 10% formalin and sent to the zooplankton laboratory at the Institute of Ocean Sciences, Fisheries and Oceans Canada (Sidney, BC), for species classification and enumeration. Zooplankton taken from the net without flowmeter were sorted into three size fractions by successively sieving through 1.7, 1.0, and 0.25 mm screens. Each size fraction was

weighed wet, dried at 60°C for 48 hours, re-weighed, and stored in plastic bags for future $\delta^{14}C$ and $\delta^{15}N$ isotope analyses.

Bongo, NORPAC and SCOR zooplankton nets were sequentially deployed at a series of stations near 50°N, 145°W in the eastern North Pacific to provide a calibration of these gear for the extensive time series of zooplankton data collected at station P from the 1950's to the 1980's. A total of 8 replicates were completed, where a replicate consisted of three consecutive vertical hauls from 150 m to the surface with the Bongo, NORPAC and SCOR nets at the same station. The net deployment and retrieval rates were 0.7 m s^{-1} and 1.0 m s^{-1}, respectively. All replicate samples were taken within ±3 hours of local noon.

The zooplankton data can be obtained from Dr. David Mackas, Plankton Productivity, Institute of Ocean Sciences, P.O. Box 6000, 9860 West Saanich Road, Sidney, BC, Canada V8L 4B2. Email: mackas@ios.bc.ca.

RESULTS

Salmon Catch Data

Table 1 reports information on the trawl tows and a summary of salmon catches for the survey. The following information is included: station ID, transect name, sampling region, date and time in Pacific Standard Time (PST), start latitude (°N) and longitude (°W), bottom depth (m), tow duration (hours), speed over ground (SOG; kts), and heading (°T; degrees true). Station ID numbers consisted of the Pacific Biological Station cruise designation ("HS9705", where HS stands for High Seas), followed by a consecutive tow number (e.g., "HS970505" for the fifth tow of the survey). The station ID number serves as the primary key in the High Seas database that links fishing tow information with the oceanographic and zooplankton tables. For each tow, catch totals are provided for chinook, chum, coho, pink and sockeye salmon of all ages combined.

Only 10 salmon were caught during the survey, of which seven were sockeye salmon and three were chinook salmon (Table 1). The sockeye salmon were all caught in the central Gulf of Alaska, and the chinook salmon were caught on the continental shelf west of Cape Chiniak, Kodiak Island, Alaska (Figures 4 and 5).

Biological Data

Table 2 reports the detailed biological data collected from each salmon caught during the survey. Individual salmon were assigned a fish number which consisted of the cruise identifier (HS9705), followed hierarchically by tow number, species code, and sample number. For example, "HS9705-031-124-001" refers to tow number 31, species code "124" for chinook salmon, and the sample number "1" (within tow and species). We used the following codes from Fisheries and Oceans' Salmon Stock Assessment

database: 108, pink salmon; 112, chum salmon; 115, coho salmon; 118, sockeye salmon; and 124, chinook salmon.

Biological data collected for each salmon included (when available): species common name, fork length (mm), whole body weight (g wet), sex, age, thermal mark code (if present), stomach content weight (g wet), and stomach content description. For this cruise, whole body weights were measured in the laboratory. Chinook salmon *HS9705-032-124-001* was examined for stomach contents at sea and a laboratory weight was not taken because the stomach had been removed. Ages are represented by the notation *i.j*, where *i* is the number of fresh water years, and *j* is the number of ocean years. The overall age of each fish is $i + j$.

For sockeye salmon, age analysis of scale samples indicated that two were in their first ocean year, two in their second ocean year, and two in their third ocean year. The age for one sockeye salmon could not be determined. The three chinook salmon were in their first ocean year.

Sockeye salmon *HS9705-068-118-004* was identified, from thermal marks on its otoliths, as originating from the Chilkat hatchery in SE Alaska. This fish was released from the Chilkat hatchery on June 8, 1994. Scale analysis indicates that it migrated out to sea in the spring of 1995, and was near the end of its second winter at sea before it was captured in the central Gulf of Alaska in March 1997. This sockeye measured 282 mm in fork length at capture.

Stomach content weights were determined in the laboratory, and the diet items were listed within major taxonomic groups. For chinook salmon *HS9705-032-124-001* and sockeye salmon *HS9705-068-118-001*, stomach contents were examined at sea and an accurate weight was not obtained.

Oceanographic Data

Table 3 reports the physical oceanographic data collected during the survey, including the station ID number, the Institute of Ocean Sciences' consecutive filename, transect, sampling region, the date and time in UTC, the latitude (°N) and longitude (°W), sea surface temperature (SST; °C) and salinity (SSS; ppt) taken from the CTD files, sea surface salinity (ppt) determined from the sample bottles that were used to calibrate the CTD probe, nitrate, silicate and phosphate concentrations (μmol L^{-1}), chlorophyll *a* and phaeophytin concentrations (μmol L^{-1}), and the ratio of fluorescence before (Fo) and after (Fa) acidification. The consecutive filename number consists of the Institute of Ocean Sciences' cruise designation (9705) followed by the consecutive number for each CTD cast on each survey. Filename numbers do not correspond to station ID's because repeat casts were conducted at some stations. At stations where expendable bathythermograph (XBT) casts were taken, the consecutive filename number uses the prefix "XBT" instead of the cruise identifier (e.g., XBT003).

Zooplankton Data

Table 4 reports the zooplankton data by station collected by the Bongo tows, including the station ID number, transect, sampling region, latitude (°N) and longitude (°W), the date and time in PST, bottom depth (m), target depth (m), tow duration, wire angle (degrees), amount of wire deployed off the winch drum (m), and volume of ocean water sampled in cubic meters. Also shown are the dry weights (g) of zooplankton which were standardised to 1,000 cubic meters sampled for the 1.7, 1.0, and 0.25 mm size factions as well as for the total sample.

Table 5 provides a record of the replicate zooplankton sampling operations. Zooplankton abundance estimates are not presented here but can be obtained from Joe Linguanti (address as noted above).

DISCUSSION

This survey demonstrated that first ocean year coho, chum and pink salmon were absent in March 1997 over a broad area of the northern Gulf of Alaska between the Queen Charlotte Islands and Kodiak Island, that included three transects across the continental shelf. These first ocean year salmon must have either moved off the continental shelf of British Columbia and central Alaska or moved westward of Kodiak Island sometime between November and early March. In contrast, three chinook salmon were caught on the continental shelf off Kodiak Island. Thus, here is some evidence for spatial segregation in winter, and species-specific distribution patterns in the Gulf of Alaska.

This survey also indicated that, by March, juvenile sockeye salmon likely wintered along with older sockeye salmon in the central Gulf of Alaska. Two age 1.1 and two age 1.2 sockeye salmon were caught in one tow taken near 51°N, 145°W. Two third ocean year sockeye salmon (0.3 and 1.3) were also caught along the southeastern track from Kodiak to 49°N, 140°W. Further sampling in this region of the eastern North Pacific, which was necessary to strengthen this association, was unfortunately cut short because of severe weather and resulting damage to the trawl.

Comparisons with two Japanese surveys by the *R/V Kaiyo Maru* conducted in December 1992 (FAJ 1993) and January 1996 (Ueno 1996), and a Canadian survey by the *F/V Anita J* in March 1995 (Welch et al. 2002), demonstrate that first ocean year juvenile salmon are well offshore during their first winter and spring. However, when catches for all winter and spring surveys are overlaid, the data suggest that the majority of juvenile salmon are located in the south-central Gulf of Alaska. They do not appear to occur in significant numbers above approximately 52°N (roughly, the latitude of the southern tip of the Queen Charlotte Islands).

It is unclear how much of the absence of salmon from the large area of the northern Gulf of Alaska in 1997 was a result of the markedly reduced levels of

abundance of all species of salmon that subsequently returned to Alaska later in the summer of 1997. The available evidence does not, however, point to a westward displacement of salmon in the spring out of the study region because of elevated ocean temperatures since surface temperatures were within 1°C of average in March and April.

Recent Canadian and United States surveys give little indication of juvenile salmon moving off the continental shelf between southern British Columbia and Kodiak Island in either the summer or fall. This suggests that juvenile salmon may move well to the west of Kodiak Island before moving south and offshore in the winter and spring period, and then moving back east in the Subarctic Current. With recent declines in marine survival of Pacific salmon stocks returning to specific regions of North America, it is important to establish those areas of the coastal and offshore ocean where salmon populations with different trends in stock abundance co-exist in the North Pacific at specific times. Oceanographic events occurring in these areas of the North Pacific at these specific times could not be responsible for such differences in survival.

As with previous fall surveys, which suggested that juvenile salmon were almost exclusively confined to the continental shelf between British Columbia and Kodiak Island, Alaska, our findings suggest that most juvenile salmon migrate westward of Kodiak Island before eventually turning south and migrating offshore. The exact timing and westward extent of the juvenile migration on the shelf needs to be clarified in order to better understand the ocean biology of Pacific salmon, and establish the times and regions where changes in ocean climate can affect them.

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Table 1. Tow positions and summary of salmon catches for the W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997.

Station ID	Transect	Region	Date	Time PST	Latitude (°N)	Longitude (°W)	Heading (°T)	Bottom Depth (m)	Head Depth (m)	Chinook	Chum	Coho	Pink	Sockeye
HS970502	MORESBY ISLAND	OFFSHORE	14-Mar-97	08:32	52.987	132.478	210	183	17	0	0	0	0	0
HS970503	MORESBY ISLAND	OFFSHORE	14-Mar-97	10:37	52.933	132.561	246	507	15	0	0	0	0	0
HS970504	MORESBY ISLAND	OFFSHORE	14-Mar-97	12:53	52.893	132.683	239	1,484	18	0	0	0	0	0
HS970505	MORESBY ISLAND	OFFSHORE	14-Mar-97	15:15	52.852	132.803	237	1,873	19	0	0	0	0	0
HS970511	OFFSHORE	OFFSHORE	15-Mar-97	08:32	53.380	135.678	279	2,036	12	0	0	0	0	0
HS970512	OFFSHORE	OFFSHORE	15-Mar-97	12:28	53.378	136.178	180	3,161	24, 15, 4	0	0	0	0	0
HS970513	OFFSHORE	OFFSHORE	15-Mar-97	16:05	53.362	136.453	129	3,369	4	0	0	0	0	0
HS970514	OFFSHORE	OFFSHORE	15-Mar-97	17:06	53.328	136.385	129	3,432	N/A	0	0	0	0	0
HS970517	OFFSHORE	OFFSHORE	16-Mar-97	08:02	53.778	138.263	050	3,332	4, 6	0	0	0	0	0
HS970518	OFFSHORE	OFFSHORE	16-Mar-97	13:41	53.955	138.822	021	3,348	5	0	0	0	0	0
HS970519	OFFSHORE	OFFSHORE	16-Mar-97	16:42	54.088	138.975	000	3,318	4	0	0	0	0	0
HS970520	OFFSHORE	OFFSHORE	17-Mar-97	07:55	54.740	141.470	332	3,687	4, 20, 40, 60, 80	0	0	0	0	0
HS970521	OFFSHORE	OFFSHORE	17-Mar-97	13:58	55.002	142.148	305	3,709	5, 26	0	0	0	0	0
HS970522	OFFSHORE	OFFSHORE	17-Mar-97	16:42	55.128	142.600	306	3,781	6	0	0	0	0	0
HS970525	OFFSHORE	OFFSHORE	18-Mar-97	06:37	55.410	145.143	343	4,070	10, 25	0	0	0	0	0
HS970527	OFFSHORE	OFFSHORE	18-Mar-97	15:53	55.667	146.012	140	4,038	8, 25, 50, 75	0	0	0	0	0
HS970528	OFFSHORE	OFFSHORE	19-Mar-97	16:09	56.177	150.070	212	5,197	5	0	0	0	0	0
HS970531	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	06:26	57.160	152.212	172	102	4	1	0	0	0	0
HS970532	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	08:05	57.085	152.197	164	102	4	1	0	0	0	0
HS970533	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	09:42	57.023	152.162	142	92	6	0	0	0	0	0
HS970534	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	12:08	56.902	151.978	180	167	5	0	0	0	0	0
HS970536	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	14:38	56.823	151.830	139	150	9	0	0	0	0	0
HS970537	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	16:08	56.767	151.748	126	215	10	0	0	0	0	0
HS970541	ALONG KODIAK	KODIAK ISLAND	22-Mar-97	12:34	57.582	152.010	178	41	4	1	0	0	0	0
HS970542	ALONG KODIAK	KODIAK ISLAND	22-Mar-97	16:58	57.132	152.178	236	102	4	0	0	0	0	0
HS970543	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	06:15	56.333	153.648	130	145	4	0	0	0	0	0
HS970544	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	07:48	56.283	153.541	119	139	5	0	0	0	0	0
HS970545	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	09:22	56.252	153.410	140	179	7	0	0	0	0	0
HS970547	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	11:12	56.212	153.313	118	373	5	0	0	0	0	0
HS970548	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	12:57	56.192	153.223	084	621	4	0	0	0	0	0
HS970549	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	14:42	56.178	153.147	105	596	7	0	0	0	0	0
HS970550	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	16:28	56.158	153.067	108	1,906	9	0	0	0	0	0
HS970553	OFFSHORE	OFFSHORE	24-Mar-97	06:20	54.623	152.252	212	4,182	10	0	0	0	0	0
HS970554	OFFSHORE	OFFSHORE	24-Mar-97	09:00	54.467	152.207	204	4,205	4	0	0	0	0	0

Table 1. Tow positions and summary of salmon catches for the W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997.

Station ID	Transect	Region	Date	Time PST	Latitude (°N)	Longitude (°W)	Heading (°T)	Bottom Depth (m)	Head Depth (m)	Chinook	Chum	Coho	Pink	Sockeye
HS970555	OFFSHORE	OFFSHORE	24-Mar-97	11:17	54.352	152.187	211	4,217	4	0	0	0	0	0
HS970556	OFFSHORE	OFFSHORE	24-Mar-97	13:49	54.202	152.142	204	4,334	4	0	0	0	0	0
HS970557	OFFSHORE	OFFSHORE	24-Mar-97	15:44	54.118	152.138	203	4,397	4	0	0	0	0	0
HS970558	OFFSHORE	OFFSHORE	24-Mar-97	17:01	54.023	152.142	208	4,458	4	0	0	0	0	0
HS970561	OFFSHORE	OFFSHORE	25-Mar-97	06:15	52.712	151.312	163	4,005	5	0	0	0	0	1
HS970562	OFFSHORE	OFFSHORE	25-Mar-97	09:03	52.545	151.138	147	3,070	4	0	0	0	0	0
HS970563	OFFSHORE	OFFSHORE	25-Mar-97	13:30	52.290	150.950	156	3,890	8	0	0	0	0	0
HS970564	OFFSHORE	OFFSHORE	25-Mar-97	15:43	52.180	150.935	141	3,336	9	0	0	0	0	0
HS970565	OFFSHORE	OFFSHORE	25-Mar-97	17:06	52.092	150.875	150	4,135	8	0	0	0	0	0
HS970568	OFFSHORE	OFFSHORE	26-Mar-97	06:15	50.740	150.255	329	4,790	8	0	0	0	0	5
HS970569	OFFSHORE	OFFSHORE	26-Mar-97	09:50	50.662	150.245	030	4,794	6	0	0	0	0	0
HS970574	OFFSHORE	OFFSHORE	28-Mar-97	13:00	48.803	143.003	082	4,149	6	0	0	0	0	0
HS970576	OFFSHORE	OFFSHORE	29-Mar-97	07:15	49.530	141.415	071	4,013	9	0	0	0	0	1
HS970577	OFFSHORE	OFFSHORE	29-Mar-97	15:35	49.543	141.282	083	3,980	14	0	0	0	0	0
HS970578	OFFSHORE	OFFSHORE	29-Mar-97	17:14	49.548	141.118	106	3,851	14	0	0	0	0	0
								Totals:		3	0	0	0	7
											Overall total:			10

Table 2. Biological data collected for each salmon caught on the CCGS W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997.

Fish Number	Species	Fork Length (mm)	Whole Body Weight (g wet)	Sex	Age	Thermal Mark	Stomach Content Weight (g wet)	Stomach Contents
HS9705-031-124-001	CHINOOK	232	152	F	N/A		0.24	Unidentified material
HS9705-032-124-001	CHINOOK	286	N/A	M	N/A		N/A	
HS9705-041-124-001	CHINOOK	234	145	F	N/A		0.86	4 fish larvae, hyperiid amphipods
HS9705-061-118-001	SOCKEYE	506	1,404	F	1.3		31.17	Squid, euphausiids, hyperiid amphipods
HS9705-068-118-001	SOCKEYE	475	1,063	F	1.2		N/A	
HS9705-068-118-002	SOCKEYE	270	172	F	1.1		0.00	
HS9705-068-118-003	SOCKEYE	263	175	F	1.1		0.00	
HS9705-068-118-004	SOCKEYE	282	208	F	1.2	CHILKAT93	0.00	
HS9705-068-118-005	SOCKEYE	294	238	M	N/A		0.00	
HS9705-076-118-001	SOCKEYE	438	902	M	0.3		1.17	Euphausiids, calanoid amphipods, hyperiid amphipods

Table 3. Physical oceanographic data collected on the CCGS W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997.

Station ID	CTD Filename	Transect	Region	Date	Time UTC	Latitude (°N)	Longitude (°W)	SST (°C)	SSS (ppt)	SSS Bottle (ppt)	NO_3 (µmol / L)	SiO_4 (µmol / L)	PO_4 (µmol / L)	Chlorophyll a (µg / L)	Phaeophytin (µg / L)	Fo / Fa
HS970501	97050002	QUEEN CHARLOTTE I.	QUEEN CHARLOTTE I.	13-Mar-97	16:01	51.543	130.060	7.45	31.91	31.894	10.10	17.60	1.04	N/A	N/A	N/A
HS970502	97050003	MORESBY ISLAND	OFFSHORE	14-Mar-97	06:19	52.999	132.455	6.78	32.14	32.238	10.80	17.20	1.19	0.204	0.238	1.52
HS970503	97050004	MORESBY ISLAND	OFFSHORE	14-Mar-97	09:26	52.941	132.511	7.06	32.19	32.209	10.50	16.50	1.14	0.214	0.226	1.55
HS970504	97050006	MORESBY ISLAND	OFFSHORE	14-Mar-97	11:37	52.901	132.643	6.97	32.22	32.237	10.90	17.20	1.31	0.242	0.232	1.58
HS970505	97050007	MORESBY ISLAND	OFFSHORE	14-Mar-97	13:47	52.861	132.770	7.08	32.25	32.260	11.50	17.90	1.16	0.361	0.280	1.64
HS970506	97050008	MORESBY ISLAND	OFFSHORE	14-Mar-97	16:01	52.823	132.892	7.24	32.29	32.289	11.00	18.40	1.17	0.321	0.222	1.67
HS970507	97050009	MORESBY ISLAND	OFFSHORE	14-Mar-97	17:33	52.847	133.070	7.02	32.29	32.329	13.30	20.30	1.26	N/A	N/A	N/A
HS970508	97050010	MORESBY ISLAND	OFFSHORE	14-Mar-97	19:06	52.892	133.299	6.93	32.30	32.305	14.10	21.60	1.21	0.181	0.181	1.57
HS970509	97050011	MORESBY ISLAND	OFFSHORE	14-Mar-97	23:54	53.065	134.246	N/A	N/A	32.505	10.80	16.50	1.11	0.229	0.200	1.60
HS970510	97050012	OFFSHORE	OFFSHORE	15-Mar-97	04:32	53.250	135.182	6.03	32.55	32.554	10.50	14.90	1.10	0.242	0.194	1.63
HS970511	97050013	OFFSHORE	OFFSHORE	15-Mar-97	07:14	53.369	135.604	5.71	32.57	32.588	11.40	16.80	1.16	0.218	0.145	1.68
HS970512	97050014	OFFSHORE	OFFSHORE	15-Mar-97	11:03	53.424	136.146	5.36	32.54	32.549	12.90	18.10	1.23	0.111	0.156	1.47
HS970513	97050015	OFFSHORE	OFFSHORE	15-Mar-97	15:09	53.367	136.462	5.76	32.56	32.569	11.30	16.40	1.13	0.182	0.175	1.58
HS970514	97050016	OFFSHORE	OFFSHORE	15-Mar-97	18:01	53.300	136.314	5.72	32.51	32.590	11.30	16.60	1.12	0.160	0.158	1.57
HS970515	97050019	OFFSHORE	OFFSHORE	15-Mar-97	23:08	53.509	137.159	5.37	32.54	32.550	12.80	18.10	1.22	0.122	0.139	1.53
HS970516	97050020	OFFSHORE	OFFSHORE	16-Mar-97	03:06	53.648	137.761	5.36	32.56	32.572	12.70	17.90	1.22	0.113	0.135	1.51
HS970517	97050021	OFFSHORE	OFFSHORE	16-Mar-97	06:59	53.779	138.288	5.33	32.54	32.559	12.60	17.70	1.18	0.116	0.123	1.55
HS970518	97050022	OFFSHORE	OFFSHORE	16-Mar-97	14:53	54.000	138.791	5.50	32.57	32.573	12.10	17.70	1.20	0.169	0.136	1.63
HS970519	97050023	OFFSHORE	OFFSHORE	16-Mar-97	17:31	54.140	138.976	5.38	32.55	32.567	12.70	18.40	1.18	0.121	0.141	1.52
HS970520	97050024	OFFSHORE	OFFSHORE	17-Mar-97	06:58	54.723	141.370	5.25	32.54	32.555	12.60	17.50	1.21	0.121	0.152	1.50
HS970521	97050025	OFFSHORE	OFFSHORE	17-Mar-97	13:02	54.994	142.135	5.32	32.55	32.558	12.30	17.90	1.19	0.139	0.146	1.55
HS970522	97050026	OFFSHORE	OFFSHORE	17-Mar-97	17:51	55.162	142.660	5.25	32.57	32.577	12.30	18.00	1.18	0.160	0.153	1.58
HS970523	97050027	OFFSHORE	OFFSHORE	17-Mar-97	21:58	55.289	143.502	4.26	32.70	32.679	16.10	25.40	1.41	0.137	0.189	1.48
HS970524	97050028	OFFSHORE	OFFSHORE	18-Mar-97	02:23	55.456	144.386	4.16	32.67	32.680	16.30	24.90	1.44	N/A	N/A	N/A
HS970525	97050029	OFFSHORE	OFFSHORE	18-Mar-97	08:06	55.520	145.237	4.36	32.70	32.707	17.10	25.90	1.46	0.278	0.209	1.65
HS970526	97050030	OFFSHORE	OFFSHORE	18-Mar-97	13:31	55.702	146.111	4.26	32.71	32.723	16.10	25.10	1.40	0.137	0.133	1.57
HS970527	97050031	OFFSHORE	OFFSHORE	18-Mar-97	18:46	55.610	146.001	4.20	32.71	32.719	16.30	25.70	1.45	0.179	0.140	1.63
HS970528	97050032	OFFSHORE	OFFSHORE	18-Mar-97	22:39	55.765	146.791	4.14	32.68	32.691	15.90	24.00	1.40	0.270	0.218	1.62
HS970530	97050033	OFFSHORE	OFFSHORE	19-Mar-97	20:53	56.355	150.616	4.50	32.63	32.633	15.90	23.70	1.46	0.106	0.112	1.55
HS970531	97050034	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	07:18	57.099	152.191	4.42	32.44	32.447	15.70	24.40	1.39	0.166	0.163	1.57
HS970532	97050035	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	08:59	57.038	152.169	4.43	32.45	32.449	15.80	25.10	1.38	0.144	0.144	1.56
HS970534	97050036	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	11:18	56.917	151.969	4.56	32.47	32.473	15.40	22.60	1.40	0.223	0.202	1.59
HS970535	97050037	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	12:57	56.852	151.958	4.57	32.49	32.487	15.00	40.10	1.41	0.269	0.225	1.62
HS970536	97050038	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	14:03	56.834	151.846	4.57	32.49	32.502	15.50	24.60	1.41	0.280	0.225	1.63
HS970537	97050039	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	15:28	56.783	151.776	4.65	32.51	32.511	15.60	24.30	1.43	0.221	0.178	1.63
HS970538	97050040	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	16:57	56.741	151.683	4.73	32.50	32.515	15.70	24.60	1.43	0.446	0.325	1.65
HS970539	97050041	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	18:52	56.640	151.538	4.84	32.51	N/A	N/A	N/A	N/A	0.173	0.139	1.63
HS970540	97050042	CAPE CHINIAK	KODIAK ISLAND	20-Mar-97	20:52	56.555	151.392	4.81	32.53	32.541	16.60	26.30	1.41	0.151	0.114	1.65
HS970541	97050043	SITKINAK ISLAND	KODIAK ISLAND	22-Mar-97	13:27	57.540	152.000	3.75	32.32	32.321	15.90	26.00	1.47	0.753	0.276	1.83
HS970542	97050044	SITKINAK ISLAND	KODIAK ISLAND	22-Mar-97	17:47	57.104	152.251	4.68	32.48	32.476	15.70	29.70	1.42	0.155	0.110	1.66
HS970543	97050045	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	05:03	56.350	153.677	4.24	32.45	32.459	14.30	22.90	1.40	0.336	0.208	1.70
HS970544	97050046	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	07:15	56.286	153.560	4.52	32.47	32.474	15.80	26.50	1.41	0.140	0.102	1.65
HS970545	97050047	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	08:51	56.258	153.428	4.34	32.44	32.455	16.00	25.80	1.44	0.142	0.129	1.59
HS970546	97050048	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	10:10	56.216	153.357	4.44	32.47	32.481	16.20	25.60	1.46	0.125	0.130	1.55
HS970547	97050049	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	10:47	56.217	153.330	4.43	32.47	32.479	N/A	N/A	N/A	N/A	N/A	N/A

Table 3. Physical oceanographic data collected on the CCGS W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997.

Station ID	CTD Filename	Transect	Region	Date	Time UTC	Latitude (°N)	Longitude (°W)	SST (°C)	SSS (ppt)	SSS Bottle (ppt)	NO_3 (µmol / L)	SiO_4 (µmol / L)	PO_4 (µmol / L)	Chlorophyll a (µg / L)	Phaeophytin (µg / L)	Fo / Fa
HS970548	97050050	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	12:05	56.186	153.249	4.39	32.45	32.457	16.00	25.30	1.44	0.140	0.136	1.57
HS970549	97050051	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	13:48	56.178	153.164	4.62	32.52	32.524	15.70	23.60	1.42	0.160	0.134	1.62
HS970550	97050052	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	15:30	56.162	153.088	4.76	32.58	32.591	16.10	24.40	1.41	0.122	0.102	1.62
HS970551	97050053	SITKINAK ISLAND	KODIAK ISLAND	23-Mar-97	21:03	55.667	152.742	3.56	32.86	32.864	18.80	30.50	1.62	0.110	0.097	1.60
HS970552	97050054	OFFSHORE	OFFSHORE	24-Mar-97	01:02	55.196	152.493	3.51	32.86	32.870	19.20	31.00	1.64	0.143	0.102	1.66
HS970553	97050055	OFFSHORE	OFFSHORE	24-Mar-97	05:31	54.657	152.242	3.57	32.88	32.887	19.40	31.80	1.65	0.128	0.087	1.67
HS970554	97050056	OFFSHORE	OFFSHORE	24-Mar-97	08:04	54.474	152.193	3.60	32.89	32.905	19.70	31.60	1.67	0.153	0.098	1.69
HS970555	97050057	OFFSHORE	OFFSHORE	24-Mar-97	10:28	54.358	152.175	3.55	32.86	32.867	19.00	31.90	1.62	0.177	0.116	1.68
HS970556	97050058	OFFSHORE	OFFSHORE	24-Mar-97	13:02	54.204	152.131	3.69	32.81	32.829	17.90	29.30	1.43	0.174	0.127	1.65
HS970557	97050059	OFFSHORE	OFFSHORE	24-Mar-97	14:58	54.124	152.139	3.71	32.81	32.824	17.90	29.30	1.63	0.146	0.101	1.67
HS970558	97050060	OFFSHORE	OFFSHORE	24-Mar-97	18:11	53.988	152.168	3.83	32.77	32.784	17.00	28.20	1.52	0.156	0.137	1.60
HS970559	97050061	OFFSHORE	OFFSHORE	24-Mar-97	22:02	53.591	151.934	3.98	32.71	32.713	17.30	27.70	1.54	0.089	0.097	1.54
HS970560	97050063	OFFSHORE	OFFSHORE	25-Mar-97	02:03	53.130	151.622	3.87	32.85	32.856	17.30	28.50	1.69	N/A	N/A	N/A
HS970561	97050064	OFFSHORE	OFFSHORE	25-Mar-97	05:28	52.754	151.344	3.88	32.85	32.849	19.00	31.20	1.66	0.110	0.092	1.61
HS970562	97050065	OFFSHORE	OFFSHORE	25-Mar-97	08:04	52.559	151.150	4.07	32.76	32.762	17.10	27.00	1.52	0.132	0.110	1.62
HS970563	97050066	OFFSHORE	OFFSHORE	25-Mar-97	12:31	52.303	150.950	4.24	32.74	32.746	16.40	25.10	2.01	0.139	0.103	1.65
HS970564	97050067	OFFSHORE	OFFSHORE	25-Mar-97	14:53	52.187	150.928	4.18	32.74	32.741	16.50	N/A	1.50	0.114	0.091	1.63
HS970565	97050068	OFFSHORE	OFFSHORE	25-Mar-97	18:17	52.017	150.801	4.19	32.73	32.741	16.40	25.50	1.49	0.151	0.126	1.61
HS970566	97050069	OFFSHORE	OFFSHORE	25-Mar-97	22:01	51.625	150.640	4.25	32.73	32.733	16.80	25.20	1.47	0.111	0.119	1.55
HS970567	97050070	OFFSHORE	OFFSHORE	26-Mar-97	02:02	51.130	150.399	4.44	32.70	32.717	14.60	21.50	1.40	0.083	0.084	1.56
HS970568	97050071	OFFSHORE	OFFSHORE	26-Mar-97	05:33	50.741	150.248	4.57	32.69	32.703	15.10	23.80	1.38	0.108	0.104	1.57
HS970569	97050072	OFFSHORE	OFFSHORE	26-Mar-97	09:01	50.662	150.263	4.49	32.71	32.714	15.50	22.90	1.41	0.131	0.118	1.60
HS970570	XBT003	OFFSHORE	OFFSHORE	27-Mar-97	15:37	49.330	147.010	6.33	32.74	32.756	14.20	18.70	1.30	0.101	0.099	1.57
HS970571	XBT004	OFFSHORE	OFFSHORE	27-Mar-97	20:53	49.130	145.900	6.32	32.73	32.832	13.10	16.50	1.22	0.211	0.157	1.65
HS970572	XBT005	OFFSHORE	OFFSHORE	28-Mar-97	02:10	48.990	145.000	6.43	32.71	32.855	12.40	17.00	1.17	0.225	0.138	1.70
HS970573	XBT007	OFFSHORE	OFFSHORE	28-Mar-97	07:30	48.900	144.000	6.63	32.60	32.842	11.30	14.50	0.99	N/A	N/A	N/A
HS970574	XBT008	OFFSHORE	OFFSHORE	28-Mar-97	12:30	48.800	143.040	6.75	32.63	32.878	10.80	14.40	1.14	0.155	0.116	1.65
HS970575	XBT009	OFFSHORE	OFFSHORE	28-Mar-97	18:37	48.990	142.000	N/A	N/A	32.798	12.40	16.70	1.18	0.181	0.124	1.67
HS970576	97050073	OFFSHORE	OFFSHORE	29-Mar-97	08:46	49.565	141.276	6.33	32.74	32.741	12.00	22.00	1.15	0.235	0.129	1.73
HS970577	97050074	OFFSHORE	OFFSHORE	29-Mar-97	18:24	49.548	141.007	6.32	32.73	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HS970578	97050075	OFFSHORE	OFFSHORE	29-Mar-97	23:07	49.670	140.009	6.43	32.71	32.717	11.50	16.80	1.17	0.265	0.152	1.72
HS970579	97050076	OFFSHORE	OFFSHORE	30-Mar-97	03:52	49.767	139.009	6.63	32.60	32.599	9.40	13.50	1.05	0.228	0.168	1.65
HS970580	97050077	OFFSHORE	OFFSHORE	30-Mar-97	08:55	49.879	138.003	6.75	32.63	32.640	9.90	20.60	1.11	0.284	0.178	1.69
HS970581	XBT010	OFFSHORE	OFFSHORE	30-Mar-97	16:00	49.933	137.000	N/A	N/A	32.626	9.50	15.70	1.21	0.274	0.139	1.75
HS970582	XBT012	OFFSHORE	OFFSHORE	30-Mar-97	20:00	50.000	136.000	N/A	N/A	32.581	8.50	16.90	1.01	0.207	0.153	1.65
HS970583	XBT013	OFFSHORE	OFFSHORE	31-Mar-97	00:23	50.008	135.000	N/A	N/A	32.587	9.70	13.50	1.14	0.268	0.247	1.59
HS970584	XBT014	OFFSHORE	OFFSHORE	31-Mar-97	04:24	50.198	134.000	N/A	N/A	32.556	11.10	44.50	1.01	0.226	0.222	1.57
HS970585	97050078	OFFSHORE	OFFSHORE	31-Mar-97	08:35	50.245	133.000	7.14	32.54	32.545	10.20	16.10	1.12	0.199	0.202	1.56
HS970586	97050079	OFFSHORE	OFFSHORE	31-Mar-97	12:59	50.346	132.007	7.68	32.55	32.562	7.10	10.10	0.93	0.228	0.145	1.69
HS970587	97050080	OFFSHORE	OFFSHORE	31-Mar-97	17:32	50.428	131.015	7.43	32.47	32.467	8.60	14.70	1.03	0.503	0.392	1.64
HS970588	97050081	OFFSHORE	OFFSHORE	31-Mar-97	22:24	50.536	130.012	8.02	32.21	32.215	7.10	13.30	0.88	N/A	N/A	N/A
HS970589	97050082	VANCOUVER ISLAND	VANCOUVER ISLAND	01-Apr-97	03:20	50.648	129.001	7.97	30.45	30.346	11.40	21.90	1.18	N/A	N/A	N/A
HS970590	97050083	VANCOUVER ISLAND	VANCOUVER ISLAND	01-Apr-97	05:23	50.696	128.608	7.96	29.68	29.773	11.10	21.40	1.09	N/A	N/A	N/A

Table 4. Zooplankton data from bongo tows collected on the W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997.

Station ID	Transect	Region	Latitude (°N)	Longitude (°W)	Date	Time PST	Bottom Depth (m)	Target Depth (m)	Tow Duration	Wire Angle (°)	Wire Out (m)	Volume Seived (m^3)	Plankton Weights by Size Fraction (g dry / 1000 m3) 1.7 mm	1.0 mm	0.25 mm	Total
HS970502	MORESBY ISLAND	OFFSHORE	52.999	132.455	14-Mar-97	07:43	176	150	0:19	N/A	N/A	259	0.72	0.15	1.09	1.96
HS970503	MORESBY ISLAND	OFFSHORE	52.940	132.512	14-Mar-97	10:11	860	150	0:07	N/A	N/A	110	0.27	0.11	0.35	0.73
HS970504	MORESBY ISLAND	OFFSHORE	52.901	132.643	14-Mar-97	12:25	1,350	150	0:10	N/A	N/A	N/A	0.80	0.04	0.64	1.47
HS970506	MORESBY ISLAND	OFFSHORE	52.823	132.892	14-Mar-97	15:39	2,520	150	0:10	N/A	N/A	132	8.13	0.08	0.82	9.02
HS970511	OFFSHORE	OFFSHORE	53.369	135.604	15-Mar-97	07:43	2,403	150	0:12	N/A	N/A	N/A	1.14	0.21	0.82	2.17
HS970512	OFFSHORE	OFFSHORE	53.424	136.146	15-Mar-97	11:31	2,362	150	0:12	N/A	N/A	N/A	1.31	0.24	0.72	2.27
HS970513	OFFSHORE	OFFSHORE	53.367	136.462	15-Mar-97	15:38	3,369	150	0:09	N/A	N/A	95	3.14	0.34	1.64	5.12
HS970514	OFFSHORE	OFFSHORE	53.300	136.314	15-Mar-97	18:29	3,405	150	0:10	N/A	N/A	151	2.16	0.10	0.61	2.87
HS970517	OFFSHORE	OFFSHORE	53.779	138.288	16-Mar-97	07:36	3,332	150	0:08	N/A	N/A	192	4.23	0.00	0.44	4.67
HS970518	OFFSHORE	OFFSHORE	54.000	138.791	16-Mar-97	14:33	3,348	150	0:15	N/A	N/A	157	4.11	0.22	0.73	5.05
HS970519	OFFSHORE	OFFSHORE	54.140	138.976	16-Mar-97	18:06	3,318	150	0:10	N/A	N/A	179	6.24	0.09	0.31	6.64
HS970520	OFFSHORE	OFFSHORE	54.723	141.370	17-Mar-97	07:29	3,659	150	0:09	N/A	N/A	222	0.00	0.21	0.41	0.62
HS970521	OFFSHORE	OFFSHORE	54.994	142.135	17-Mar-97	13:30	3,729	150	0:15	N/A	N/A	101	8.37	0.19	0.81	9.37
HS970522	OFFSHORE	OFFSHORE	55.162	142.660	17-Mar-97	17:33	3,781	150	0:13	N/A	N/A	196	5.13	0.02	0.24	5.39
HS970525	OFFSHORE	OFFSHORE	55.520	145.237	18-Mar-97	08:40	4,016	150	0:10	N/A	N/A	147	2.73	0.17	0.25	3.14
HS970526	OFFSHORE	OFFSHORE	55.702	146.111	18-Mar-97	14:02	4,051	150	0:18	N/A	N/A	236	4.96	0.02	0.39	5.37
HS970527	OFFSHORE	OFFSHORE	55.610	146.001	18-Mar-97	18:20	4,053	150	0:13	45	212	217	3.69	0.09	0.24	4.02
HS970531	CAPE CHINIAK	KODIAK ISLAND	57.099	152.191	20-Mar-97	07:43	80	60	0:07	34	72	95	2.93	0.09	0.87	3.89
HS970532	CAPE CHINIAK	KODIAK ISLAND	57.038	152.169	20-Mar-97	09:18	70	60	0:06	34	70	157	2.78	0.01	0.45	3.24
HS970534	CAPE CHINIAK	KODIAK ISLAND	56.917	151.969	20-Mar-97	11:40	81	60	0:08	55	102	110	4.35	0.18	0.61	5.13
HS970535	CAPE CHINIAK	KODIAK ISLAND	56.852	151.958	20-Mar-97	13:21	86	60	0:05	35	73	91	12.53	0.13	0.70	13.36
HS970538	CAPE CHINIAK	KODIAK ISLAND	56.783	151.776	20-Mar-97	17:35	787	150	0:11	40	195	179	6.74	0.04	0.51	7.29
HS970539	CAPE CHINIAK	KODIAK ISLAND	56.640	151.538	20-Mar-97	19:27	1,027	150	0:10	54	254	239	3.84	0.03	0.53	4.40
HS970540	CAPE CHINIAK	KODIAK ISLAND	56.555	151.392	20-Mar-97	21:40	2,018	150	0:10	39	195	208	9.14	0.22	1.06	10.42
HS970541	SITKINAK ISLAND	KODIAK ISLAND	57.540	152.000	22-Mar-97	13:33	67	50	0:07	40	65	70	0.58	0.04	2.88	3.50
HS970542	SITKINAK ISLAND	KODIAK ISLAND	57.104	152.251	22-Mar-97	18:00	78	60	0:07	53	100	134	8.13	0.01	0.27	8.41
HS970543	SITKINAK ISLAND	KODIAK ISLAND	56.350	153.677	23-Mar-97	05:11	67	55	0:06	42	74	96	2.86	0.05	2.21	5.12
HS970544	SITKINAK ISLAND	KODIAK ISLAND	56.286	153.560	23-Mar-97	07:25	69	60	0:06	45	84	110	0.48	0.51	0.94	1.93
HS970545	SITKINAK ISLAND	KODIAK ISLAND	56.258	153.428	23-Mar-97	08:57	82	80	0:08	50	125	128	0.39	0.00	1.06	1.45
HS970546	SITKINAK ISLAND	KODIAK ISLAND	56.216	153.357	23-Mar-97	10:18	180	150	0:13	42	200	185	2.94	0.04	1.03	4.01
HS970548	SITKINAK ISLAND	KODIAK ISLAND	56.186	153.249	23-Mar-97	12:28	621	150	0:11	43	150	168	1.62	0.03	0.75	2.39
HS970549	SITKINAK ISLAND	KODIAK ISLAND	56.178	153.164	23-Mar-97	14:08	596	150	0:17	55	263	267	4.05	0.05	0.39	4.49
HS970550	SITKINAK ISLAND	KODIAK ISLAND	56.162	153.088	23-Mar-97	15:58	1,567	150	0:13	42	200	241	5.73	0.06	0.54	6.32
HS970554	OFFSHORE	OFFSHORE	54.474	152.193	24-Mar-97	08:29	4,205	150	0:15	40	194	184	12.08	0.34	0.25	12.68
HS970555	OFFSHORE	OFFSHORE	54.358	152.175	24-Mar-97	10:48	4,217	150	0:13	40	195	192	7.56	0.31	0.42	8.29
HS970556	OFFSHORE	OFFSHORE	54.204	152.131	24-Mar-97	13:21	4,334	150	0:13	45	211	166	10.32	0.11	0.26	10.69
HS970557	OFFSHORE	OFFSHORE	54.124	152.139	24-Mar-97	15:17	4,397	150	0:12	43	205	152	9.10	0.40	0.61	10.11
HS970558	OFFSHORE	OFFSHORE	53.988	152.168	24-Mar-97	18:33	4,534	150	0:16	42	200	180	12.87	0.12	0.35	13.35
HS970562	OFFSHORE	OFFSHORE	52.559	151.150	25-Mar-97	08:31	3,070	150	0:11	35	183	148	17.09	0.32	0.56	17.97
HS970563	OFFSHORE	OFFSHORE	52.303	150.950	25-Mar-97	12:52	3,890	150	0:11	42	198	175	8.77	0.81	0.45	10.03
HS970564	OFFSHORE	OFFSHORE	52.187	150.928	25-Mar-97	15:14	3,336	150	0:13	45	211	195	8.86	0.48	0.54	9.87
HS970565	OFFSHORE	OFFSHORE	52.017	150.801	25-Mar-97	18:38	4,644	150	0:17	51	240	265	14.31	0.49	0.59	15.38
HS970569	OFFSHORE	OFFSHORE	50.662	150.263	26-Mar-97	09:22	4,795	150	0:10	37	190	178	10.23	0.87	0.49	11.58

Table 5. Replicate sampling conducted to compare zooplankton abundance estimates with Bongo, SCOR and NORPAC nets, on the W.E. Ricker survey to the Gulf of Alaska, March 11 - April 3, 1997.

Date	Latitude (°N)	Longitude (°W)	Gear	Replicate Number	Flowmeter Reading	Start Time (PST)	Start Time (PST)	Tow Duration	Target Depth (m)	Wire Angle (°)	Wire Out (m)
29-Mar-97	49.565	141.276	NORPAC	1	1,220	09:25	09:40	0:15	150	30	170
29-Mar-97	49.565	141.276	SCOR	1	1,930	09:41	09:55	0:14	150	20	160
29-Mar-97	49.565	141.276	Bongo	1	1,122	10:02	10:17	0:15	150	21	161
29-Mar-97	49.565	141.276	NORPAC	2	1,375	10:30	10:45	0:15	150	17	157
29-Mar-97	49.565	141.276	SCOR	2	1,235	10:45	10:55	0:10	150	15	155
29-Mar-97	49.565	141.276	Bongo	2	1,327	10:55	11:03	0:08	150	15	155
29-Mar-97	49.565	141.276	SCOR	3	1,715	11:10	11:21	0:11	150	22	167
29-Mar-97	49.565	141.276	NORPAC	3	2,340	11:23	11:35	0:12	150	10	153
29-Mar-97	49.565	141.276	Bongo	3	1,186	11:36	11:47	0:11	>144	0	>144
29-Mar-97	49.565	141.276	NORPAC	4	1,740	12:00	12:25	0:25	140	0	>140
29-Mar-97	49.565	141.276	SCOR	4	3,490	12:27	12:40	0:13	NA	15	>155
29-Mar-97	49.565	141.276	Bongo	4	1,825	13:17	13:25	0:08	140	0	140
29-Mar-97	49.565	141.276	SCOR	5	1,855	13:41	13:56	0:15	140	0	140
29-Mar-97	49.565	141.276	NORPAC	5	1,050	13:58	14:07	0:09	140	0	140
29-Mar-97	49.565	141.276	Bongo	5	1,900	14:11	14:19	0:08	121	30	140
29-Mar-97	49.565	141.276	SCOR	6	1,960	14:22	14:30	0:08	135	15	140
29-Mar-97	49.565	141.276	NORPAC	6	1,070	14:31	14:42	0:11	140	0	140
29-Mar-97	49.565	141.276	Bongo	6	1,000	14:43	14:53	0:10	137	12	140
29-Mar-97	49.565	141.276	NORPAC	7	1,225	14:53	15:02	0:09	115	35	140
29-Mar-97	49.565	141.276	SCOR	7	1,167	15:03	15:10	0:07	130	22	140
29-Mar-97	49.565	141.276	Bongo	7	1,440	15:13	15:21	0:08	138	10	140
30-Mar-97	49.879	138.003	SCOR	8	1,925	10:35	10:48	0:13	149	33	178
30-Mar-97	49.879	138.003	NORPAC	8	2,383	10:55	11:08	0:13	151	33	180
30-Mar-97	49.879	138.003	Bongo	8	2,145	11:17	11:30	0:13	156	12	160

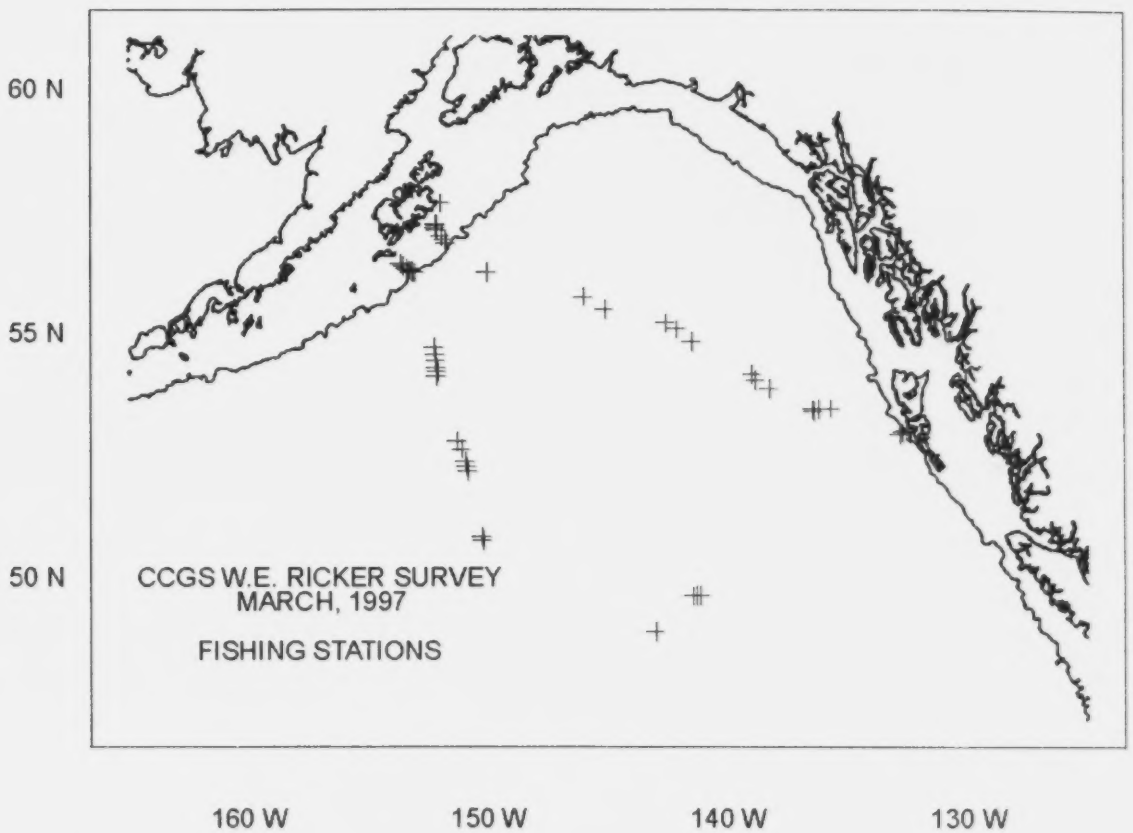

Figure 1. Fishing stations completed on the CCGS W.E. Ricker survey to the Gulf of Alaska during March 11 - April 3, 1997.

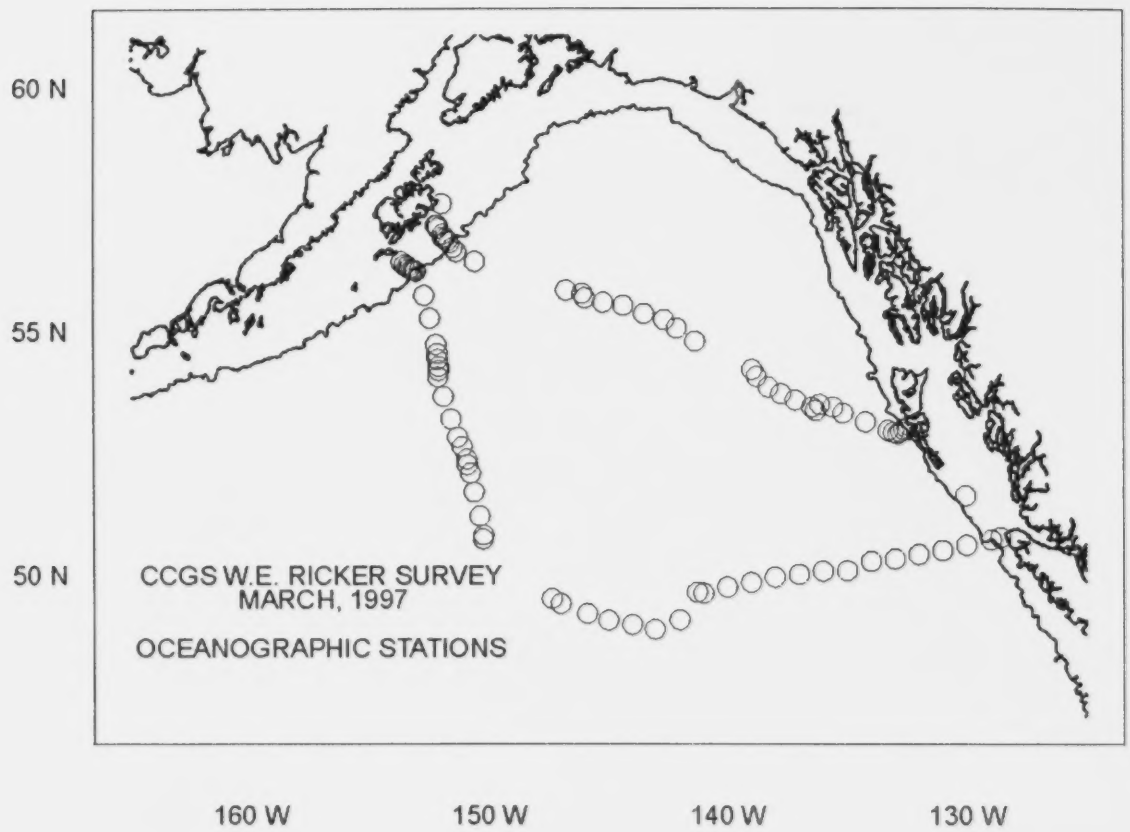

Figure 2. Oceanographic stations completed on the CCGS W.E. Ricker survey to the Gulf of Alaska during March 11 - April 3, 1997.

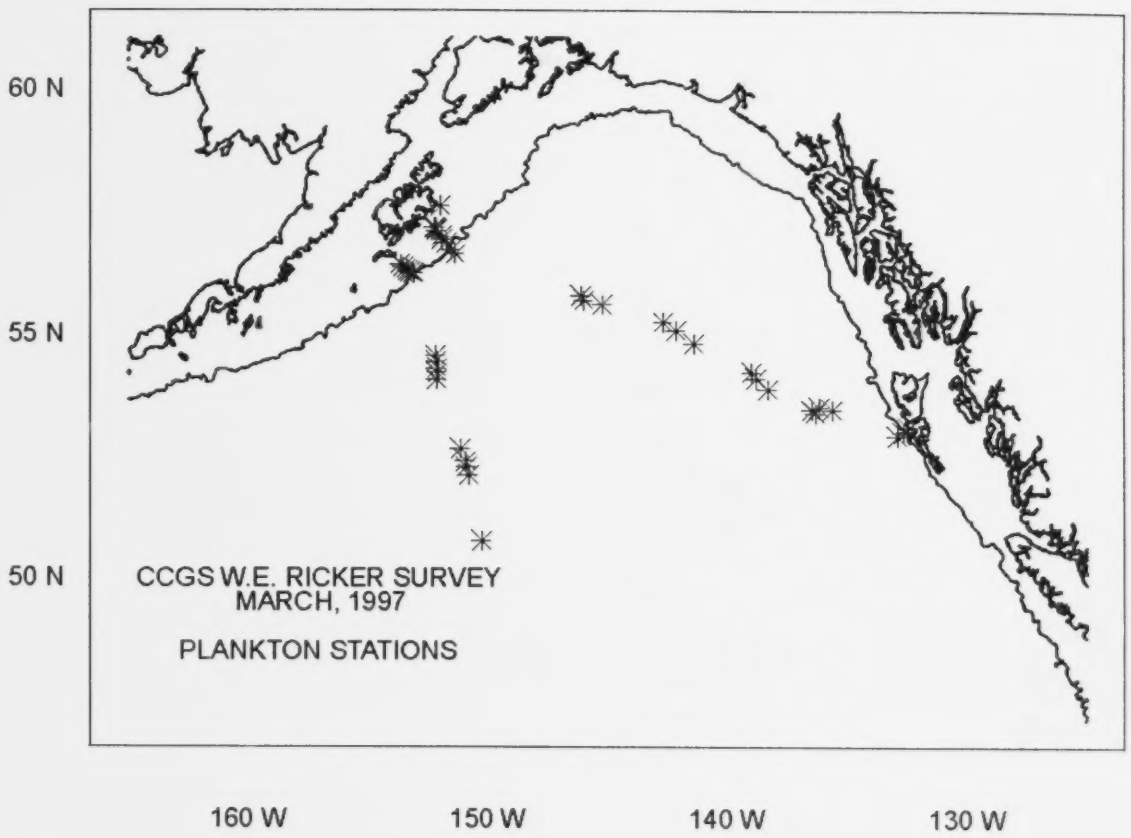

Figure 3. Zooplankton stations completed on the CCGS W.E. Ricker survey to the Gulf of Alaska during March 11 - April 3, 1997.

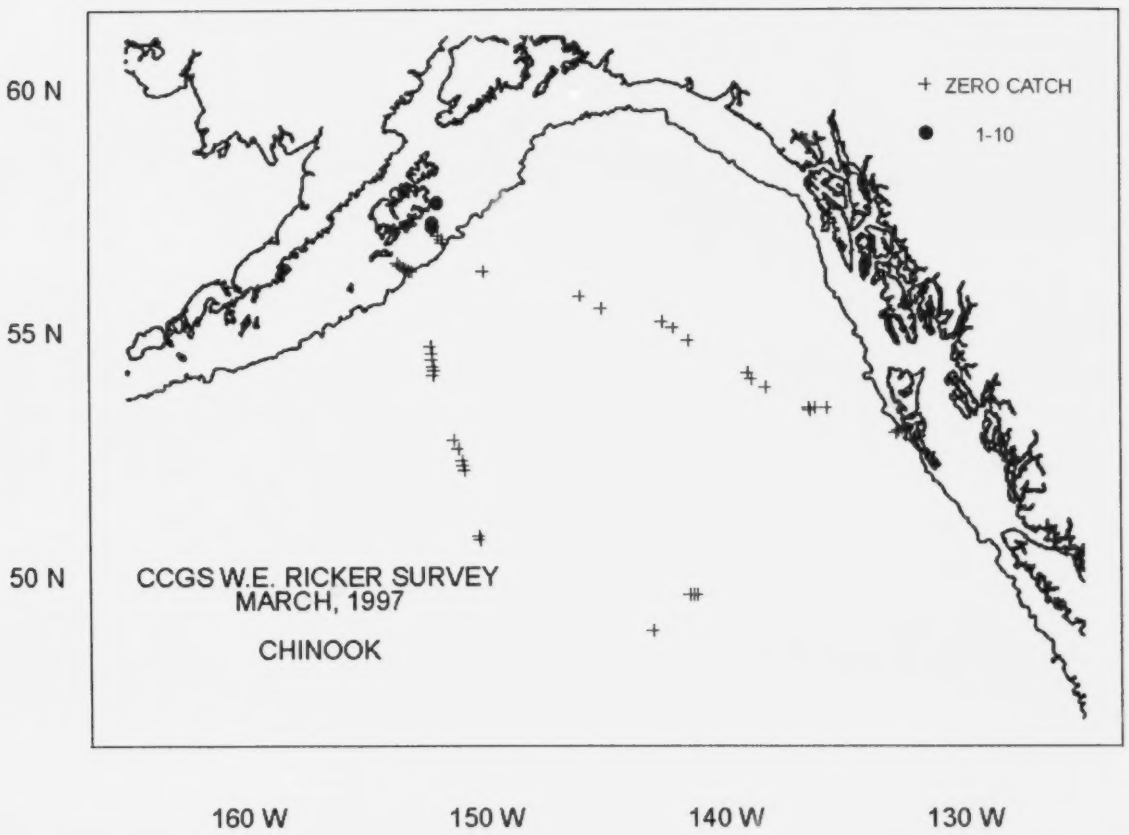

Figure 4. Summary of chinook salmon catches on the CCGS W.E. Ricker survey to the Gulf of Alaska during March 11 - April 3, 1997.

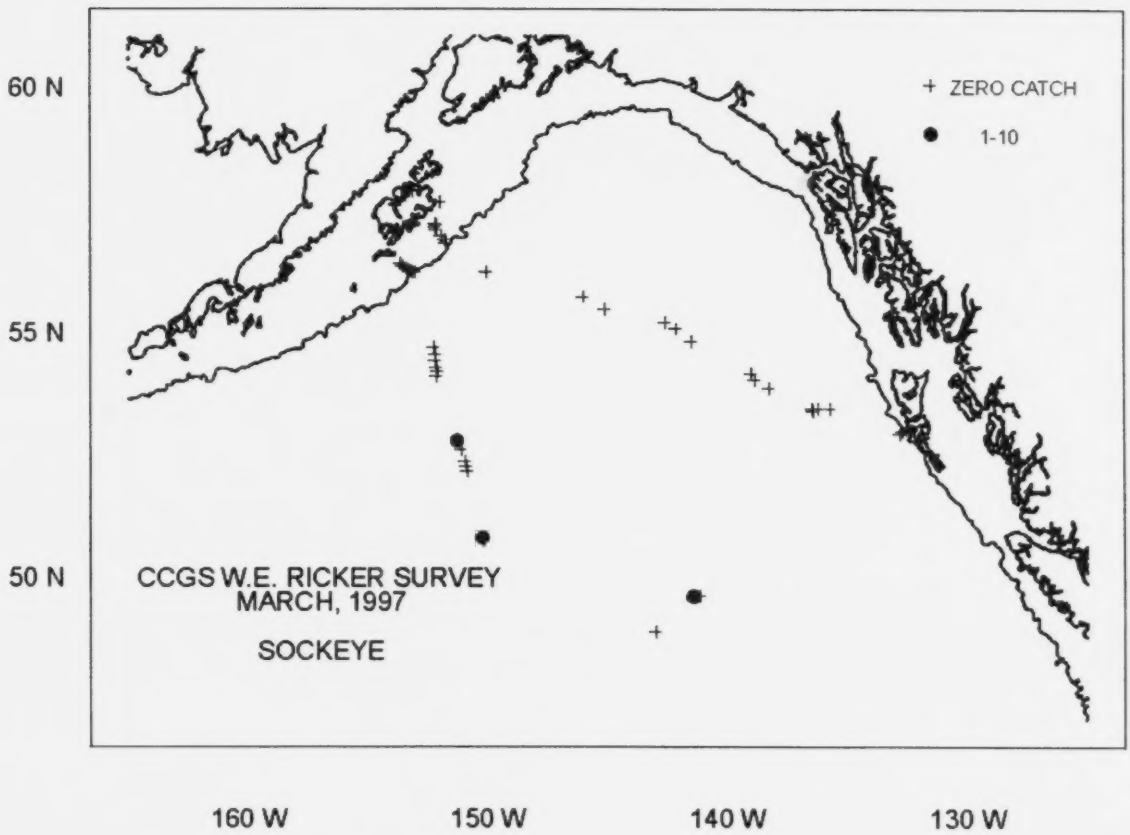

Figure 5. Summary of sockeye salmon catches on the CCGS W.E. Ricker survey to the Gulf of Alaska during March 11 - April 3, 1997.